

The role of extensive pastoralism in vulture conservation

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Summary

Although livestock is mostly considered in a rather negative way regarding ecosystem conservation worldwide, some livestock practises could significantly contribute to nature conservation in some concrete cases. Among the wild species which can benefit from livestock presence, vultures are one of the groups more closely related to livestock rearing worldwide. As long as both Asian and European recent vulture conservation crisis have been mostly related to more intensive livestock practises, extensive pastoralism seems to be a much more sustainable alternative for scavenger conservation. Free-ranging livestock, much more difficult to control, would provide enough food to maintain healthy vulture populations. By maintaining carcass unpredictability, it simulates a more natural food source in terms of supporting the natural ecological processes related to carcass exploitation. Although there are also some negative impacts of extensive pastoralism on vultures (e.g. illegal poisoning), both the intensification and abandonment of grazing systems, and specially of more traditional practises, is expected to negatively influence vulture conservation. The areas abandoned by extensive pastoralism could be occupied by other activities (e.g. cropland, urbanisation) which would not provide alternative food sources for vultures. The intensification of grazing systems may result in a higher use of veterinary drugs together with changes in livestock breeds and/or species (e.g. from cows and sheep to pigs and poultry). To effectively halt the ongoing disappearance of extensive pastoralism, and specially of traditional practises, it is needed a legal framework integrating agricultural, environmental and rural development policies. These policies should focus on identifying and supporting those livestock rearing practises which provide clearly defined environmental public goods (e.g. biodiversity, water availability). Monitoring and evaluation of these policies is also fundamental to ensure their achievement. If we aim to preserve natural ecosystems with functional scavenger communities, further

research is needed on the complex relationship between extensive pastoralism and vultures.

1 Introduction

Many different names are used to refer to extensive pastoralism as a livestock rearing system with a high reliance on natural resources and a low dependency on external inputs (Mateo-Tomás et al. in prep.). Some of these names include agro-pastoral, agro-silvo-pastoral, pastoral, grazing or pasture-based systems. Whatever the name we use to define these farming systems, they all have a key characteristic in common: the use of pastures as the basic natural resource to raise livestock. Pastures cover 26% of the Earth's ice-free surface, supporting about 200 million pastoral households and herds of nearly a billion cattle, camelids, sheep, goats, horses, yaks, reindeer and other ungulates (Mateo-Tomás et al. in prep.). Pastures play a role in global environmental change, influencing climate change or biodiversity conservation, something which has caught the public's attention in recent decades (Steinfeld et al. 2006a; Bernués et al. 2011). In fact, livestock, including both extensive and intensive operations, is considered among the main threats to ecosystem integrity worldwide (Steinfeld et al. 2006b). It causes deforestation, soil compaction and erosion and threatens biodiversity, mainly through habitat loss and specially in developing countries. Livestock is also responsible for 18% of greenhouse gas emissions and for over 8% of global human water use (Steinfeld et al. 2006b). Nonetheless, although livestock is mostly considered in a rather negative way regarding ecosystem conservation worldwide, livestock-environment relationships are highly complex (Steinfeld et al., 2010; Mateo-Tomás & Olea submitted). Thus, livestock could significantly contribute to nature conservation in some concrete cases, mostly when regional scales are considered (Toutain et al., 2010; EFNCP, 2012). The decrease of extensive pastoralism can therefore have negative impacts on vegetation cover or water availability (Steinfeld et al., 2010), being also related to the conservation status of several wild species (Bergier & Cheyland 1980; Amar et al., 2010; Mateo-Tomás & Olea, 2010a; Steinfeld et al., 2010).

When talking about livestock-dependent biodiversity, it is mandatory to talk about scavengers, and more concretely about vultures. Vultures are among the wild species more closely related to livestock worldwide (Sekercioglu et al., 2004). They have progressively increased their dependence on livestock as a primary food source in most world regions. This strong dependence has resulted from sharp - mainly human-induced - reductions of wild ungulate species combined with increasing livestock numbers (Mateo-Tomás et al. in prep.). The rapid negative impact of the veterinary drug Diclofenac on Asian vultures (Oaks

et al. 2004) is one the most famous examples of the current strong dependence of vultures on livestock. The consequences of the massive use of this drug has not only affected vulture conservation (Cuthbert et al., 2006; Ogada et al. 2012) but also ecosystem function and local socioeconomy in southeast Asia (Markandya et al. 2008). Similarly, in Europe, the management of the bovine spongiform encephalopathy (BSE) crisis has negatively influenced scavenger conservation (Tella 2001). By reducing livestock carcass availability, the sanitary measures taken to control BSE have also caused several socioeconomic conflicts, e.g. conflicts with farmers due to vulture attacks to livestock (Margalida et al. 2011). These two vulture conservation crises have called both public and scientific attention on vultures in recent decades. Both crises have highlighted not only the close relationship of vultures with livestock, but also how deeply changes in livestock management can affect the conservation of these species and the ecosystems they inhabit (Mateo-Tomás 2009).

2 Extensive pastoralism and vultures

As long as both the Asian and the European vulture conservation crises are mostly related to more intensive livestock practises, extensive pastoralism seems to be a much more sustainable alternative for the conservation not only of scavengers but also of many ecosystems (Mateo-Tomás 2009; Margalida et al. 2010). Although the information available on the interactions between vultures and grazing systems is still limited, free-ranging livestock, much more difficult to control (e.g. to collect dead animals), would provide enough food to maintain healthy vulture populations worldwide (Mateo-Tomás 2009; Olea & Mateo-Tomás 2009; Margalida et al. 2010). Additionally, by coexisting with wild ungulates in many regions, extensive pastoralism allows to maintain alternative food resources for vultures (Mateo-Tomás 2009; Mateo-Tomás & Olea 2010b). Thus, these vulture populations will be less dependent on variations in food quantity and quality due, for example, to sanitary regulations (e.g. those approved to control BSE; Tella 2001). Moreover, through maintaining certain carcass unpredictability, free-ranging livestock simulates a more natural food source for scavengers in terms of maintaining the ecological processes related to carcass exploitation (Sekercioglu et al. 2004; Mateo-Tomás 2009; Margalida et al. 2010). Temporally and spatially predictable resources such as those provided at feeding stations can negatively influence ecosystem equilibrium by favouring common (e.g. Griffon vulture *Gyps fulvus*) over scarcer, and often threatened species (e.g. Egyptian vulture *Neophron percnopterus*; Deygout et al. 2009; Cortés-Avizanda et al. 2012). This high resource predictability could also even modify, to a often unknown extent, species habits (Deygout et al. 2009; Olea & Mateo-Tomás 2009; Mateo-Tomás & Olea 2010b; Margalida et al.

2011). In extensive systems, the use of antibiotics and other veterinary drugs is generally lower than in intensive farming operations (Reid et al. 2010), reducing the risks associated with vultures feeding on medicated livestock (e.g. death, decreasing survival rates, Oaks et al. 2004).

Extensive livestock practices can also have negative impacts on vulture conservation. Illegal poisoning of wildlife may be the most important conservation threat related to livestock presence in the field (Mateo-Tomás et al. 2012). The illegal use of poison in wild habitats is mainly due to retaliatory killing of wild predators preying on free-ranging livestock (Mateo-Tomás et al. 2012). This is an important threat to vultures, since they are more skilled at locating and first accessing the poisoned remains than terrestrial predators (Ruxton & Houston 2004). Thus, illegal poisoning is suggested to be the main cause of the current vulture declines in east Africa (Virani et al. 2011) as well as the main cause of the local extinction of many Griffon vulture populations in Europe during the past century (e.g. Romania, Cyprus,...; Mateo-Tomás et al. 2012; GYPAS 2013). Other potentially negative impacts of extensive livestock farming on vultures could be related to the use of veterinary drugs (although generally lower than in intensive farming; Reid et al. 2010; see above). Landscape changes due to overgrazing (e.g. vegetation encroachment) can also have a negative impact on vultures, making more difficult carcass location and access (Simmons et al. 2011).

Nonetheless, most of these negative impacts of livestock on biodiversity (including vultures) are minimised when considering more traditional forms of extensive pastoralism such as, for example, transhumance (Ruiz & Ruiz 1986). These traditional grazing systems are characterised by variable stocking rates and, especially, by a high mobility of livestock flocks which prevents some of the most common negative impacts of extensive pastoralism on natural ecosystems (e.g. overgrazing; Olea & Mateo-Tomás 2011). Moreover, the labour-intensive management techniques employed by these systems (e.g. shepherds, dogs) cause minimal human-predator conflicts, reducing retaliatory activities such as poisoning (Olea & Mateo-Tomás 2009; Mateo-Tomás et al. 2012). The persistence of these traditional grazing activities is frequently highlighted as a key factor for the conservation of several vulture species in developed regions such as Europe. A strong relationship between vultures and transhumance has been proved for Griffon vultures in NW Spain (Olea & Mateo-Tomás 2009). It appears therefore that the ongoing disappearance of transhumance (Mateo-Tomás & Olea 2010c; Olea & Mateo-Tomás 2011) might have a negative influence on the conservation of this vulture species and even on other species, such as, for example, the endangered Egyptian vulture. In fact, the disappearance of transhumance in some regions of France

is considered as one of the main threats to Egyptian vulture conservation, causing a sharp reduction in food availability (Bergier & Cheyland 1980). Further evidence (Mateo-Tomás & Olea 2010a; Cabrera-García et al. 2012) suggests that this species may be heavily dependent on extensive small livestock farming practises (i.e. sheep and goat rearing). Other vulture species such as the Bearded vulture *Gypaetus barbatus* seems to be also related to mobile livestock flocks. Altitudinal movements of the species in Crete correspond to the seasonal distribution of sheep flocks and goat herds (Xirouchalis & Nikolakakis 2002). In Spain, the dehesa, a landscape highly dependent on the existence of transhuman flocks (Olea & Mateo-Tomás 2011), is a key habitat for the conservation of the Black vulture (*Aegypius monachus*; Carrete & Donázar 2005).

3 Future trends

Most traditional grazing systems are currently threatened by either intensification or abandonment (Steinfeld et al. 2006b). Both trends are already occurring in many European High Nature Value (HNV) farmlands and are reported as the main drivers of change in agricultural landscapes (European Environment Agency 2010). They are responsible for “losses of distinctive biodiversity, among both domesticated and wild species, and of ecosystem services provided by managed landscapes” according to the Secretariat of the Convention on Biological Diversity (2010).

Regarding vulture conservation, the abandonment of traditional livestock practises will result in landscape changes (e.g. increasing forest and shrub coverage) which could reduce vulture accessibility to carcasses (Simmons et al. 2011). Although the initial food reduction due to livestock disappearance could be compensated by an increase in wild ungulate species, the abandonment of some areas by livestock could facilitate the development of cropland, urban or touristic areas which would not effectively provide alternative food sources for vultures (Mateo-Tomás et al. in prep.). The intensification of grazing systems, which will mainly consist of increasing stocking rates (Davies et al. 2010; Mateo-Tomás & Olea submitted), could be expected to positively influence vultures through increasing food availability. However, this intensification will also result in a higher use of veterinary drugs (Reid et al. 2010), whose devastating effects on vultures are already known (Oaks et al. 2004; Ogada et al. 2012). Moreover, intensification will cause landscape modification through overgrazing (see above) and will promote changes in the main livestock species reared (Mateo-Tomás & Olea submitted). Large-sized mammals such as cows and, specially, sheep and goats will be replaced by more profitable species, specially pigs and poultry, leading to more intensive farming (Steinfeld et al. 2010; Mateo-Tomás & Olea submitted).

In looking for a more clear response to how the changes in grazing systems could affect vulture species, some results, in this case with the Egyptian vulture, show a maximum threshold above which, increasing extensive livestock density does not result in increasing habitat suitability for the species (Mateo-Tomás & Olea submitted). Although a similar response is probably not expected for the Griffon vulture (much more dependent on large carcasses than the Egyptian vulture) these results provide a promising starting point from which assessing the complex livestock-environment relationship in order to promote better sustainable grazing practises. Conservation managers can assess the sustainability of extensive pastoralism regarding its impact on other components of the ecosystem on the basis of the minimum requirements (e.g. stocking rate, livestock species) needed by livestock-dependent species such as the Egyptian vulture (Mateo-Tomás & Olea submitted).

4 Final recommendations

Many policies are being designed and/or implemented to guarantee the conservation of agro-ecosystems that depend on traditional agricultural practises (e.g. Common Agricultural Policy (CAP) in Europe; Cooper et al., 2009; Reid et al., 2010; EFNCP, 2012). The complexity of the agro-pastoral systems and the factors that affect their sustainability (e.g. use of resources, degree of intensification, economic and social issues) make it difficult to state what is sustainable with respect to ecosystem conservation (Cooper et al., 2009; Steinfeld et al. 2010; Bernués et al. 2011). Broadly speaking, more sustainable grazing practises are characterised by highly variable, generally low, stocking rates, high mobility of the flocks and labour-intensive management (Bernués et al. 2011). All these factors make it necessary to consider these grazing systems not only in terms of environmental indicators (e.g. livestock-dependent species, land use, etc.) but also of socio-economic demands (e.g. markets). Thus, it is necessary to use a multidisciplinary approach to find the right balance between efficient animal production and environmental performance (Mateo-Tomás et al. in prep.).

Considering vulture conservation, it is urgent to deal with the changes experienced by the extensive livestock sector since they will have important consequences for vulture conservation (see above; Olea & Mateo-Tomás 2009; Mateo-Tomás & Olea 2010a). It is therefore needed to effectively halt the ongoing loss of extensive pastoralism, especially of traditional practices. A legal framework integrating agricultural, environmental and rural development policies is needed to reverse the intensification or abandonment of these grazing systems (Mateo-Tomás et al. in prep.). These policies should focus on improving the implementation of effective measures to support realistically

sustainable agro-pastoral systems. It is critical to identify and support those farms really providing clearly defined environmental public goods of interest (e.g. biodiversity, cultural landscape, resilience to fire, water availability; Cooper et al. 2009). Monitoring and evaluation of the impact of these policies is also fundamental to ensure the logical achievement and implementation of these policies (Cooper et al. 2009; Bernúes et al. 2011). If we aim to preserve natural ecosystems with functional scavenger communities, further research should be developed to better understand the complex relationship between vultures and extensive pastoralism (Mateo-Tomás & Olea submitted).

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Griffon vultures from Crete at the holding cage of Agios Giannis, Cyprus © Dave and Jan Walker